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Short Communication

"Small sample properties of ML, COLS and DEA estimators of frontier models in the presence of heteroscedasticity" by A.N. Bojanic, S.B. Caudill and J.M. Ford, *European Journal of Operational Research* 108, 1998, 140–148: A comment

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Abstract

This paper comments on the paper by Bojanic et al. (1998) in this Journal. © 2002 Elsevier Science B.V. All rights reserved.

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The above-referenced paper by Bojanic et al. (1998) is in need of correction in both its title and its content. The simulations reported in this paper were *not* conducted with DEA. They were conducted with the model by Aigner and Chu (1968) presumably standing in for DEA. However, the Aigner and Chu models are not examples of DEA. They are better referred to as "goal programming" approaches to parameter estimation of prescribed (and explicitly stated) functional forms with only one-sided deviations permitted. In fact, the origin of the work by Aigner and Chu (as well as the origin of goal programming) may be found in Charnes et al. (1955), Charnes et al. (1978), and Charnes et al. (1986).

DEA is a *non-parametric* approach to evaluating individual entities referred to as DMUs (Decision Making Units) where the evaluations refer to various types of efficiency, e.g., technical or returns-to-scale inefficiencies – as determined from the data. It does not require explicit statement of the functional forms (there may be more than one) which are assumed to relate inputs to outputs and there is no attempt to estimate parameters like those which are of interest in the Bojanic et al. study. [1]

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[1] It is possible, however, to jointly use DEA with statistical regressions to obtain parameter estimates that satisfy the technical efficiency assumption used in economics. See Bardhan et al. (1998).

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Several of the references cited by Bojanic et al. do deal with comparisons of DEA and statistical regression approaches, but the focus of these papers is on efficiency evaluation rather than parameter estimates. It is problematic, therefore, to try to compare the results from these studies with the results secured by Bojanic et al. Although not cited by Bojanic et al., there have also been simulation studies of the relative performances of DEA and statistical regressions in the presence of misspecification. For instance, Banker et al. (1996) – see also Smith (1997) – used simulations to study performances when the data were generated by models which used variables that differed from the ones used to effect the estimates. This differs, of course, from the misspecifications studied by Bojanic et al. It is perhaps of interest to note, however, that (just as in their case) the statistical approach referred to as COLS (Corrected Ordinary Least Squares) performed very well – being outperformed by the BCC model (but not the CCR model) of DEA. See Banker et al. (1996). In any case, it is also worth noting that Bojanic et al. served a useful purpose by calling attention to a lacuna in the DEA literature. None of the simulation studies in the DEA literature had dealt with heteroscedasticity. An attempt to correct this situation is therefore reported in Banker et al. (2000) where it was found that DEA performed very well in the presence of heteroscedasticity.

In conclusion we note that there is more than one DEA model so it is necessary to specify which ones are being used. See Ahn et al. (1988) for characterizations of these models and their relations to each other.

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